INFLATION AND OIL BASED DEVELOPMENT:
FAILURE OF THE MONETARIST MODEL
IN SAUDI ARABIA

by
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Abstract

   In order to determine a major cause of inflation in Saudi Arabia a monetarist model is developed and found to explain little of the observed pattern of price change. The inadequacy of the monetarist model in explaining the rate of inflation in Saudi Arabia raises the question as to whether or not the money supply is an exogenous variable in the country. If the money supply increases in response to other forces such as industrialization, some inflation will be the inevitable result of the structural factors underlying changes.

Introduction

   One of the most dramatic developments following the OPEC price increases of 1973-74 has been the balance of payment's position of most countries. In particular, the balance of payments accounts of Saudi Arabia have shown abnormally large surpluses on current account, balanced primarily by a massive accumulation of foreign exchange.

   This development has a number of important implications for the conduct of the government's economic policy, for the balance of payments in an open economy plays an important role in determining changes in the stock of domestic money. International reserve inflows, for example, will increase the domestic stock of money if they are added directly to

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the money balances of residents, or if they are exchanged for domestic currency at the central bank.

It is quite possible that reserve flows are an important factor, and perhaps at times the dominant one, in determining changes in the kingdom's domestic stock of money. This observation raises questions as to the major determinants of Saudi Arabian reserve flows and what role if any can government policy play in affecting these movements. To arrive at some tentative conclusions as to the nature of this adjustment mechanism in the Saudi Arabian context, estimates are made of the determinants of the kingdom's long run reserve position. This analysis is undertaken in the light of recent developments in the monetary theory of the balance of payments.

A related adjustment of importance in forecasting the economy is the manner in which the inbalance between aggregate supply and demand has been reconciled through price changes. Since 1972, the rate of inflation experienced in Saudi Arabia has been much higher than during the preceding two decades. Saudi authorities have continually stressed that the current inflation is largely a result of the (unavoidable) transmission of world inflation into the domestic price system. On the other hand, SAMA has indicated that part of the blame for domestic inflation must lie with the highly expansionary expenditure programs introduced by the government following the 1973 oil price increases and the resulting increase in the gap between aggregate demand and supply.

The nature of the inflationary process in Saudi Arabia must be identified and quantified before a number of fundamental long run decisions such as the rate of oil production, the level of government domestic spending, and the value of the riyal/dollar exchange rate can be intelligently made. In attempting to identify the type and sources of inflation experienced particularly after 1972 in the kingdom, three main questions need to be addressed: (1) to what extent has recent inflation been imported rather than domestically generated; (2) precisely what role have government expenditures played in creating and sustaining infla- tionary pressures, and (3) has the country's underlying monetary mechanism been fundamentally different than that experienced in most other developing countries, and if so in what way and with what implications for stabili- zation policy.

Saudi Arabian Balance of Payments Accounts

The fact that the Saudi Arabian government receives virtually all the oil revenue and at the same time determines the volume of imports and how the remaining surplus will be invested abroad, makes it difficult to

arrive at an estimate of the country's balance of payments position. More precisely, the distinction between the capital account and foreign exchange reserve items (on which the official definition of payments disequilibrium is based) usually is based on the assumption that the individuals or groups who make investment decisions (which are recorded in the capital account) are different from those who undertake residual or accomodating transactions (which appear as foreign exchange reserve flows). Because of the government's unique role, this assumption is obviously not valid for the kingdom. Thus it is not at all clear what the best measure of the country's balance of payments surplus would be.

For example, between 1974 and 1976 the country ran an accumulated current account surplus of just over $54 billion. Only about $23 billion in foreign exchange reserves were, however, accumulated during the same period [1]. Since the government made almost all of the other $31 billion in foreign investments, the distinction between foreign exchange reserves and the remainder of Saudi Arabia's foreign assets is at best arbitrary. It is, therefore, somewhat misleading to suggest that Saudi Arabia had a payments surplus of only $23 billion during this period.

Given the institutional environment in Saudi Arabia, it might be more reasonable to use the current account as the measure of payments disequilibrium. By this measure we get a surplus of $54 billion for Saudi Arabia during the 1974-76 period. Clearly, this measure conflicts with the notion that foreign exchange reserves are supposed to be highly liquid, since it is not reasonable to view Saudi investments in long and medium term assets as constituting reserves.

On the other hand, the « basic » balance of payments format [2], where the balance of payments is measured as the sum of the current and long term capital accounts, avoids this problem by placing such non-liquid investments above the line as autonomous items. Short term investments are placed below the line with official foreign exchange reserves. Since the vast majority of Saudi investments were in short term assets during this period, the difference between the current account and the « basic » balance of payments results would have been quite small. As more and more of the kingdom's long term revenues flow into investments, the difference between the two accounts would become considerably larger.

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[1] Balance of payments figures are from INTERNATIONAL MONETARY FUND, *Balance of Payments Yearbook*, various issues.

[2] These definitions are from R. STERN, *The Balance of Payments: Theory and Economic Policy* (Chicago: Aldine, 1973), Ch. 2.

More fundamentally, however, the use of the « basic » format still leaves the question of whether Saudi medium and long term investments are really autonomous. Does the kingdom really have a preference of investing abroad or are officials doing so only because huge current account surpluses make it necessary to put the resulting surplus funds somewhere other than in the domestic economy. The latter interpretation argues that these investments are in fact really accommodating and consequently that the current account is the best measure of Saudi Arabia's payments position seen from this perspective. The $54 billion figure appears to be a far better estimate of the Saudi payments surplus during the 1974-76 period than the $23 billion figure suggested by the official settlements accounts ([3]).

The fact remains, however, that whatever final measure is chosen, the definition of Saudi Arabia's balance of payments surplus will, unlike the case in most countries, be essentially based on a set of arbitrary definitions. There can be no presumption that at any particular point in time it will necessarily reflect with any degree of accuracy the usual autonomous and accommodating forces implied in the balance of payments statements.

A Framework for Analysis

One way of avoiding making arbitrary definitions of the country's balance of payments is to use the monetary approach to the balance of payments. The main characteristic of this approach is to group and classify all the items in the balance of payments into: (1) the money account, and (2) the trade plus capital account. Based on the principle of double entry accounting, these two accounts are equal. By combining trade and capital items, this approach thus avoids any artificial distinction as to what items should be considered autonomous or accommodating.

In general the approach emphasizes the budget constraint imposed on the country's international spending and views the various accounts of the balance of payments as the « windows » ([4]) to the outside world

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([3]) Cf. Robert DUNN, « Exchange Rates, Payments Adjustment, and OPEC: Why Oil Deficits Persist », Princeton University, International Finance Section, *Essays in International Finance No. 137* (December 1979), pp. 7-8, for an excellent discussion of this point.

([4]) Jacob FRENKEL and Harry JOHNSON, « The Monetary Approach to the Balance of Payments: Essential Concepts and Historical Origins », in Jacob Frenkel and Harry Johnson, *The Monetary Approach to the Balance of Payments* (Toronto: University of Toronto Press, 1976), p. 22.

through which the excess of domestic flow demands over domestic flow supplies and the excess domestic flow supplies over domestic flow demands are cleared.

Accordingly, surpluses in the trade account and the capital account, respectively, represent excess flow supplies of goods and securities, and a surplus in the money account reflects an excess domestic flow demand for money. Consequently, in analyzing the money account (or the more familiar rate of increase or decrease in the country's international reserves), the monetary approach focuses on the determinants of the excess domestic flow demand for, or supply of money.

Clearly, a consistent use of the budget constraint implies that the money account — the current rate of change of reserves — can be analyzed in terms of the determinants of all the other accounts — at the simplest level of aggregation, the goods account and the capital account. The monetary approach, however, stresses an analysis in terms of the behavioral relationship directly relevant to the money account rather than an analysis in terms of the determinants directly related to the other accounts (and only indirectly to the money account via the budget constraint) [5].

The monetary approach should, in principle, provide a picture no different from that obtained upon summing of an analysis of the individual capital and trade accounts.

In order to facilitate applying the approach to the Saudi Arabian balance of payments data, it is assumed that:

1. Transactions recorded in the kingdom's balance of payments are essentially a reflection of monetary phenomena. Emphasis is, therefore, placed on the direct influence of excess demands for or supplies of money on the country's balance of payments.

2. The demand for and supply of money are stable functions of a limited number of variables. Changes in the money supply are, of course, not the only factors which affect the balance of payments. It is nevertheless assumed that real variables affect the balance of payments indirectly by first affecting the demand for or supply of money.

3. It follows that the analysis of the impact of a policy or other change must begin with an analysis of how this change generates a divergence between actual and desired money balances or affects such a divergence that already exists.

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[5] *Ibid.*

4. As noted the approach does not rely on an analysis of the individual balance of payments subaccounts; it is sufficient to aggregate individual components (goods, services, transfers, short and long term capital) into a simple single category — « items above the line ». This procedure is pragmatic in that it recognizes that an excess supply of or demand for money may be cleared through the markets for either goods, services, or securities. If the balance of payments is viewed within this framework, the pitfalls also noted above of placing emphasis on any of the kingdom's particular subaccount are avoided.

5. An accurate analysis of the kingdom's balance of payments can only be made in the long run. The approach recognizes that short run analysis is often complicated by the fact that the assumed adjustment mechanisms are incomplete during this frame. For example, the adjustment of actual money balances to their desired levels does not occur instantaneously, but rather requires the passage of time.

6. The balance of payments adjustment process under the above assumptions is automatic. More specifically, any balance of payments disequilibrium or exchange rate movement reflects a disparity between actual and desired money balances and will automatically correct itself. Any balance of payments inbalance or exchange rate change is thus assumed to be a phase in the automatic adjustment process. It follows that attempts by the Saudi authorities to counter these processes would merely increase the forces which give rise to the adjustment ultimately required for a return to equilibrium.

7. It follows that attempts by SAMA to neutralize the impact of international reserve flows on the domestic money supply are not possible in the long run. The long run success in neutralizing the effects of international reserve flows implies that the Saudi authorities would be willing (since the country usually has a surplus) to trade investment and consumption goods for foreign currency balances. The accumulation of these balances by Saudi Arabia would represent a nonmarket induced transfer of wealth away from the kingdom to foreign consumers. There is no reason to assume the government would pursue such a policy in the long run.

To summarize, the monetary approach used to examine Saudi Arabia's balance of payments stresses:

1. The kingdom's balance of payments problems are monetary problems in a monetary world economic system. It follows that these pro-

blems need to be analyzed by a model that explicitly specifies monetary behavior and integrates it with the real economy, rather than by a model that concentrates on real relationships and treats monetary behavior as a residual of real behavior.

2. Money is a stock not a flow. Therefore, the model stresses that monetary equilibrium and disequilibrium require analysis of stock equilibrium conditions and stock adjustment processes.

3. Although money can be obtained from two alternative sources: (a) the expansion of domestic credit and the exchange of goods or assets for international money, and (b) conversion of international into domestic money via the monetary authority with fixed exchange rates only the second would affect the kingdom's balance of payments.

It should be emphasized again that the focus of the analysis is the overall balance of payments, and not only the balance of trade (many writers in different contexts have confused the two and write indifferently about the trade balance and the overall « official settlements » balance).

The Model

The basic proposition that Saudi Arabia's balance of payments is determined by a mechanism which restores equilibrium between the supply of and demand for money can be illustrated by the following simple algebraic model [6].

In equilibrium money supply is equal to money demand or:

(a)
$$MS = MD .$$

Assuming the money multiplier to be fixed (and for convenience equal to one), equation (a) can be written as:

(b)
$$MD = MB$$

where MB is equal to the monetary base; i.e., the sum of net foreign (R) and SAMA's domestic assets (D). Therefore:

(c)
$$MB = R + D .$$

Assuming the demand for money in Saudi Arabia to be a function of nominal income (Yn) and the interest rate (i), MD can be written as:

(d)
$$MD = f (Yn , i) .$$

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[6] The notation follows that of Robert McNown and Myles WALLACE, « International Reserve Flows of OPEC States: A Monetary Approach », *The Journal of Energy and Development* (Spring 1977), pp. 267-278.

Equating (c) and (d), transforming from levels to changes, and solving for the change in foreign reserve, ΔR, yields:

(e) $$\Delta R = -\Delta D + f_Y \Delta Yn + f_i \Delta i$$

where ΔR is the balance of payments surplus (or deficit), f_Y and f_i are the rate of change of money demand with respect to income and interest, respectively.

An alternative formulation could be obtained by assuming the demand for money to be homogeneous of degree one in prices so that:

(f) $$MD = Pf(Yr, i).$$

Here Yr is real income and P is the domestic price level. Equating (f) to (c) and transforming to percentage rate of change yields:

(g) $$\dot{R}(R/MB) = -\dot{D}(D/MB) + e_y \dot{Yr} + e_i \dot{i} + \dot{P}.$$

Here e_y and e_i are the income and interest elasticities of the demand for money, a dot over each variable symbolizes a percentage rate of change and (R/MB) and (D/MB) are weights.

Implicit in the model is that causality runs from money demand to money supply; i.e., attempts by SAMA to increase the money supply (MB) (by changing, for example, the level of domestic assets) above the quantity demanded will result in an outflow of reserves. Similarly, an increase in the demand for money will result in a reserve inflow.

It is also clear from this formulation that the kingdom will tend to gain international reserves as its real income and domestic price level rise (nominal income). Similarly, it will lose international reserves if SAMA attempts to expand the money supply by increasing domestic assets (or as the interest rate rises).

These conclusions logically follow from the assumed impact of increases in interest rates and prices on the demand for or supply of money; i.e., increases in real income induce a rise in the demand for money, while an increase in the interest rate reduces that demand. Furthermore, an increase in the domestic price level reduces the real money supply and induces an inflow of reserves.

While this conclusion may seem at odds with standard Keynesian theory, the effects of both the interest rate and price level follow from the assumption that, in monetary equilibrium, domestic inflation and interest rates are closely linked to and primarily determined by changes in the respective world rates. Consequently, reserve flows induced by price or interest rate differentials between Saudi Arabia and the rest of the

world in the short run Keynesian world, are absent in this longer run equilibrium approach [7].

Absence of price or interest rate differentials is also assured by the assumption of close substitutability among the goods and services of Saudi Arabia and its trading partners. In the limiting case of perfect substitutability (in the long run), interest rates and price levels would be fully equalized between Saudi Arabia and her trading partners.

The results (equation 1 - 3) imply that:

1. For all practical purposes, the supply of money under SAMA's control rather than the domestic quantity of money is ultimately determined by the flow of foreign reserves in conjunction with government budgetary decisions.

2. That foreign reserve flows can and do operate to restore equilibrium in the money market i.e., that the massive reserve inflows in recent years have been necessary to satisfy the increased domestic demand for money arising from the oil price induced increases in real income.

3. That any balance of payments disequilibria experienced by Saudi Arabia must inevitably be transitory; i.e., the country's authorities may be able if they wish to « sterilize » acquisitions of international reserves, but they would eventually exhaust their stocks of domestic assets, including possibly the ability to force domestic commercial banks to hold international assets instead of domestic assets.

4. The authorities would in this case be able to continue to sterilize reserve inflows only by lending the money back to foreign countries on non-commercial terms.

5. As long as real income continues to rise at rates which are rapid relative to those for the rest of the world, the demand for money in the kingdom will continue to rise relative to the demand for money in other countries. Assuming the government does not move dramatically towards budgetary deficits, this increased demand for money must necessarily come from additional reserve inflows.

Weighted Change in Foreign Assets

$$(1) \quad S\dot{F}A\,(SFA/MB) = -0.77\,ius + 3.94\,NO\dot{X}N - 0.81\,\dot{D}C\,(DC/MB) -$$
$$\quad\quad\quad\quad\quad\quad\quad\quad (6.49) \quad\quad (3.78) \quad\quad\quad (15.36)$$

$$-300.81\,\Delta DFGDP - 26.03$$
$$\quad (2.07) \quad\quad\quad\quad (1.03) \quad\quad\quad\quad\quad\quad\quad\quad r^2 = 0.9969;\ F = 83.49$$

[7] *Ibid.*, p. 270.

Change in Foreign Assets

(Current Prices)

$$(2) \quad \Delta SFA = -1.00\,DC + 3.98\,\Delta NOXN + 8.39\,\Delta DFGDP -$$
$$ (31.72) \quad\quad (5.11) \quad\quad\quad (4.03)$$

$$ -\,1.12\,PC - 1.98$$
$$ (-2.60) \quad\;\; (3.74) \quad\quad\quad\quad\quad r^2 = 0.9988; \;\; F = 1927.20$$

(Constant Prices)

$$(3) \quad \Delta SFAP = -0.99\,\Delta DCP + 0.69\,NOXNP - 0.03$$
$$ (-91.60) \quad\quad\;\; (5.16) \quad\quad (-0.17)$$
$$ r^2 = 0.9988; \;\; F = 4210.03$$

Credit

The money supply is traditionally regarded as one of the main explanatory variables for private sector credit. This link is the basis for much monetary policy. Yet much discussion has centered around the fact that monetary policy acts with a lag. When decisions are taken to affect the money supply, there is usually a year's lag until the new credit conditions begin to affect the real sectors of the economy. As noted above, a strong link seems to exist from oil revenues to net foreign assets to government expenditure to the money base to the money supply. Several functional forms expressing the link between lagged government revenues (*GORFSPL*), exports (*FEXPTNAR*) and real domestic credit (*DCP*) were tested (equations 4 - 13) and confirmed this mechanism. Changes in domestic credit ΔDCP were related to real non-oil income (*NOXNP*) and changes in foreign assets ($\Delta SFAP$). Private credit (*PCP*) in turn was largely related to domestic credit and non-oil income.

Domestic Credit

(Constant Prices)

$$(4) \quad DCP = 1.39\,DCPL + 0.28\,GORFSPL - 3.47$$
$$ (4.66) \quad\quad (1.79) \quad\quad\quad (-1.18)$$
$$ r^2 = 0.8313; \;\; F = 32.03$$

$$(5) \quad DCP = -1.45\,FEXPTNAR - 0.87\,GORFSPL + 11.89$$
$$ (-2.34) \quad\quad\quad (-2.96) \quad\quad\quad (1.98)$$
$$ r^2 = 0.8531; \;\; F = 37.75$$

(6) $\quad \Delta DCP = 0.09\,NOXNP - 0.97\,\Delta SFAP - 0.44$
$\qquad\qquad (5.21) \qquad (-137.80) \qquad (-1.97)$
$\qquad\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9993; \ F = 9573.51$

(Current Prices)

(7) $\quad DC = -0.96\,GENAN - 0.92\,FEXPTNA + 10.23$
$\qquad\qquad (-3.55) \qquad\quad (-8.71) \qquad\qquad (3.39)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9826; \ F = 337.87$

(8) $\quad \Delta DC = -0.96\,FEXPTNA + 5.43\,\Delta NOXN + 4.72$
$\qquad\qquad (-3.82) \qquad\qquad (3.18) \qquad\quad (0.92)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.5552; \ F = 8.84$

(9) $\quad \Delta DC = 0.78\,GENAN - 0.97\,FEXPTNA + 10.23$
$\qquad\qquad (-3.55) \qquad\quad (-8.71) \qquad\qquad (3.39)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9826; \ F = 337.87$

Private Credit

(Constant Prices)

(10) $\quad PCP = -0.02\,DCP + 0.08\,NOXNP + 0.80$
$\qquad\qquad (-3.95) \qquad (3.16) \qquad\quad (4.38)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9171; \ F = 71.93$

(Current Prices)

(11) $\quad PC = -0.04\,DC + 0.05\,NOXN + 0.94$
$\qquad\qquad (-7.44) \qquad (3.03) \qquad\quad (7.12)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9907; \ F = 637.42$

(12) $\quad PC = 0.23\,NOXN - 3.66\,DFGDP - 0.04\,DC + 3.32$
$\qquad\qquad (2.52) \qquad\quad (-1.35) \qquad\quad (-2.98) \qquad (1.68)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9896; \ F = 381.68$

(13) $\quad \Delta PC = -0.06\,\Delta SGD + 0.09\,\Delta SFA - 0.03\,NOXNL + 0.26$
$\qquad\qquad (-8.58) \qquad\quad (14.21) \qquad\quad (-5.02) \qquad\quad (4.03)$
$\qquad\qquad\qquad\qquad\qquad\qquad r^2 = 0.9783; \ F = 165.62$

Inflation

A number of variables and relationships have been hypothesized possibly contributing to the country's recent inflationary episode. The following empirical analysis includes a discussion of the evidence on (1) the influence of foreign trade or openness variables on inflation, (2) the impact of excess demand on inflation, (3) the contribution of fiscal development variables to inflation, (4) the monetarist explanation of inflation, and (5) the process of reserve sterilization.

Openness and Inflation

Recent empirical work [8] indicates that there is a relationship between the degree of national integration into the world economic system and inflation; i.e., in general the more open countries have experienced less price inflation. Presumably openness serves as a kind of safety valve; domestic inflationary pressure spills over into the balance of payments in the open economy thus necessitating less price inflation.

One way of testing for the effect of openness on domestic inflation is to test various formulations of a price equation with measures reflecting the degree of contact with the world economy included as one of the dependent variables. For example, several variables that might be included are: (1) the import: income ratio (ZAB), (2) the rate of change of the import: income ratio $(RZAB)$; (3) the terms of trade (ratio of import prices to export prices, $ZITT$); (4) the rate of growth of the money supply $(GM1)$, and (5) the rate of growth of real income $(GNOXR)$ and expected inflation $(FAXL)$ [9].

One would expect the import income ratio to be negatively related to the rate of inflation, large increases in the money supply should be inflationary especially during periods when the economy is operating at or near full employment. Similarly, a rapid rate of growth of income may cause inflation because of the creation of bottlenecks or a general difficulty to shift resources around at short notice.

Since a rise in the price of imports (and indirectly perhaps exports) will tend to induce a rise in the general price level, the terms of trade should be positively related to the rate of inflation. Finally, it may be assumed that the change in openness will be negatively related to the rate of price increase [10].

The rate of inflation (the rate of change in the non-oil GDP deflator) was regressed on the above dependent variables for the period 1961-1978. The final result (equation 12) goes somewhat against our initial hypothesis.

[8] See M. A. IYOHA, « Inflation and Openness in Less Developed Economies: A Cross Country Analysis », *Economic Development and Cultural Change* (October 1973), pp. 31-38, and M. A. AKHTAR, « An Empirical Note on Inflation and Openness in Less Developed Economies », *The Philippine Economic Journal* (1976), pp. 636-649.

[9] *FAXL* is the expected rate of inflation defined here as the inflation rate in the previous year minus the inflation rate in the year prior to that. See A. HARBER, « The Dynamics of Inflation in Chile », in C. CHRIST, ed., *Measurement in Economics* (Stanford: Stanford University Press, 1963), pp. 219-250.

[10] AKHTAR, *op. cit.*, p. 637.

The sign of *ZAB* is positive reflecting perhaps the fact that as Saudi Arabia increased imports after 1973 to offset domestic shortages, world prices were simultaneously increasing. Clearly, the OPEC price increases and world inflation are closely related. The monetary growth (either $M1$ or $M2$) was not significant interestingly enough; therefore, four largely exogenous non-monetary variables — *ZAB*, *GWP*, *GNOXR*, and *FAXL* account for nearly 99 percent of the fluctuations in the rate of Saudi Arabian domestic inflation.

Deviations from the Trend as a Measure of Excess Demand

It is often argued that at least three characteristics of countries at Saudi Arabia's level of development limit the effectiveness of deviations from the trend (*DTNOXR*) as a measure of excess demand [11], namely the high share of agricultural products in both production and consumption, the high rates of inflation and the uneven growth of productive capacity. Saudi Arabia while still considered a developing country is abnormal in not having any of these particular features. The agriculture sector is quite small; until the 1970s there was only negligible inflation and because of oil revenues and the resulting relative lack of an effective foreign exchange constraint productive capacity has proceeded at a somewhat even pace.

A second limitation of the usefulness of *DTNOXR* often cited [12] as a measure of excess demand is that it incorporates the assumption that productive capacity grows at a constant rate.

While this will not necessarily be true in developed countries, it is often far less likely to be the case in developing countries, given their dependence on unstable export earnings for the purchase of imported capital goods. Saudi Arabia, however, does not suffer from limitations on imports. In addition its rate of capital formation has tended to be constrained simply by a rather constant level of absorptive capacity rather than a fluctuating rate of foreign exchange earnings.

Implicit in the use of *DTNOXR* is the notion that when the growth of output rises above its long run trend, domestic productive capacity is being strained and prices therefore must rise in order for output to

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[11] An excellent survey of these issues is given in Edmund SHEEHEY, « On the Measurement of Imported Inflation in Developing Countries », *Weltwirtschaftliches Archiv* (1979), pp. 68-78.

[12] *Ibid.*

expand. Admittedly this assumption is best suited to an advanced economy in which the production and consumption of goods consist largely of industrial products for which supply is flexible enough to respond to short run shifts in demand. Because in most developing countries production and consumption are concentrated heavily on agricultural products (which in the short run are more subject to fluctuations in domestic supply than in domestic demand), it is questionable whether the DTNOXR formulation of inflationary pressures would be satisfactory. Again in Saudi Arabia's case the relatively small agricultural sector means that the country should not experience such a high degree of short rigidity and therefore the DTNOXR approach might be somewhat more applicable.

A third reason ([13]) commonly used for doubting the applicability of DTNOXR as an accurate measure of demand pressure in developing countries is their generally higher rates of inflation and money supply growth. Within a limited range changes in short run demand pressure will tend to result partially in higher non-agricultural output and partially in price increases. Presumably, there is a point beyond which an increase in demand will result in higher prices only. Again, it is often argued that this point is probably surpassed more often in a developing country because of its higher rate of money supply increase (and the likelihood that, with the greater share of agricultural production in GDP, its short run elasticity of supply is lower).

Again an examination of Saudi Arabia's monetary expansion indicates that the kingdom experienced increases in liquidity more or less in line with the more advanced countries.

If we accept the fact that most of the arguments against using DTNOXR as a measure of excess demand are not applicable for Saudi Arabia, the question remains as to the best structural form for testing the impact of this variable on domestic prices. Several formulations were tried with the final (equations 5, 6, 9, 10 and 11) yielding significant and positive results.

The results confirm that abnormally high rates of growth in the kingdom have been associated with periods of price increase. Of interest is the fact that changes in the GDP deflator ($\Delta DFGDP$) are much more sensitive to DTNOXR than changes in oil prices (equation 10). DTNOXR by itself only accounts for about 60 percent of the changes in the GDP deflator.

([13]) *Ibid.*

Excess Demand and Domestic Inflation

The tests for openness and deviations from the trend suggests that a useful framework for the analysis of inflation in Saudi Arabia would be to directly examine the link between real expenditures and domestic price change. Real demand in Saudi Arabia is determined in part by factors that depend on aggregate supply and in part by factors that are determined independently of supply. This approach assumes that it is in fact the factors that bring demand and supply into balance that are ultimately responsible for the economy's domestic price changes. For purposes of analysis, real demand is defined in terms of expenditures in constant prices and includes: planned expenditures, private expenditures, foreign expenditures for exports, and imports.

Planned expenditures are defined here ([14]) as consisting of government consumption and gross domestic investment. Part of gross domestic investment such as social services and education grows more or less in line with GDP in Saudi Arabia. But the other component of investment is defense. Obviously defense expenditures cannot be regarded as determined by economic factors, although they are conditioned somewhat by economic capacity.

With these considerations in mind several variables were created and used in the regression equations for domestic price changes. They included ([15]) (in constant prices):

$FSMIAS$ = incremental aggregate supply
$FSMPA$ = planned absorption
$FSMPI$ = planned impact
$FSMIDA$ = incremental domestic absorption
$FSMIPI$ = incremental planned impact

Also included were:

$FWPIND$ = world inflation
$ADNP$ = real domestic supply
$DTNOXR$ = deviation of real non-oil GDP from its trend
$DANP$ = domestic absorption.

([14]) Following Arthur SMITHIES, *The Economic Potential of the Arab Countries* (Santa Monica: Rand Corporation, 1978), p. 21. .

([15]) See SMITHIES, *op. cit.*, for a detailed definition of the items comprising each variable.

In equation 7, Table 1, *FSMIPI* and *FSMIDA* were found to be statistically significant and account for nearly 80 percent of the observed change in the non-oil GDP deflator.

An approximation to this approach looks at the excess liquidity created in the process of demand expansion (Table 2).

$$(EXCESS = M1/NOXNP).$$

In contrast to the assumptions above, one using the monetary approach to study inflation in Saudi Arabia would undoubtedly begin with the fundamental proposition that the kingdom's inflation is merely an interaction of market supply and demand for money (and non-financial objects). Put differently, price movements are viewed by this model as systematically dependent upon current and immediate past evolutions of the interaction between supply and demand conditions.

The starting point of this analysis is the basic monetarist model([16]) derived from the equation of exchange. More specifically, it assumes a simple money demand function of the following form:

(h) $M/PY = Y^a C^b$

where M is the (exogenously determined) nominal stock of money; P is the price, and Y is a measure of real income, and C is the expected cost of holding real balances. Equation (h) is solved for P and expressed in terms of growth rates or (depicted by G prefixing the variable):

(i) $INF = RM1 - (1-a) GY - bGC .$

Equation (i) incorporates the basic elements of the monetarist approach to inflation: money, real income, and the expected cost of holding real balances. In addition this formulation captures the basic methodological bias of the monetarist school; i.e., the equation has a limited number of variables, and the nature of relationships is clear and straightforward. The growth of money relative to output and cost of holding real balances will generate an increase in the rate of inflation. The growth of real income will cause decreases in the rate of inflation (via absorbing money in the increased demand for real balances). Similarly, the rate of inflation is assumed to be inversely related to the expected cost of holding real balances.

Equation (i) assumes instantaneous adjustment of monetary changes and no money illusion. Therefore, the tested form of the monetarist equation is:

(j) $INF = a + a_1 CM1 + a_2 GM1L - GYNOXR + FAXL$

([16]) See HARBERGER, *op. cit.*, for a detailed discussion of the assumptions underlying the model.

TABLE 1.

SAUDI ARABIA: INFLATIONARY MECHANISMS
(Two Stage least square estimates)

Variable	Estimated Equation	r^2	F
The GDP Deflator (DFGDP)			
1. DFGDP =	$3.45\ WPIND - 0.03\ ADNP - 1.64$ (14.31) (−6.72) (−9.02)	0.9662	185.88
2. DFGDP =	$0.11\ EXCESS + 1.55$ (15.51) (22.14)	0.9207	46.44
3. DFGDP =	$-0.02\ ADNP + 0.14\ DANP - 0.09$ (−3.14) (11.26) (0.06)	0.9485	119.80
4. DFGDP =	$0.94\ DFGDPL + 0.63\ WPIND - 0.52$ (10.31) (4.17) (−4.58)	0.9826	394.97
5. DFGDP =	$24.43\ DTNOXR - 0.96$ (12.25) (10.41)	0.9077	150.08
6. DFGDP =	$5.19\ DTNOXR + 0.71\ DFGDPL + 0.61\ WPIND$ (1.93) (4.86) (4.38)	0.9865	316.15
Change in GDP Deflator (DDFGDP)			
7. DDFGDP =	$-0.09\ FSMIAS + 0.21\ FSMIDA + 0.15\ FSMIPI + 0.01$ (−2.35) (3.76) (2.02)	0.9765	15.65
8. DDFGDP =	$1.01\ WPINDL - 0.19\ DFGDPL - 0.73$ (7.62) (−2.87) (−8.02)	0.9114	66.86
9. DDFGDP =	$0.61\ WPIND - 15.7\ DWPIND + 1.98\ DTNOXR$ (4.54) (−3.95) (1.94)	0.9385	61.01
10. DFGDP =	$5.21\ DTNOXR + 0.42\ DWPIND$ (4.00) (0.80)	0.6096	11.71
11. DDFGDP =	$5.65\ DTNOXR - 0.07$ (4.83) (1.20)	0.5929	23.23
Inflation (INF)			
12. INF =	$40.29\ ZAB + 0.53\ GWP + 1.55\ GNOXR + 0.98\ FAXL - 27.75$ (2.81) (2.23) (6.00) (7.37) (4.93)	0.9865	316.15

TABLE 2.

SAUDI ARABIA: INFLATIONARY PRESSURES
(Two Stage least square estimates)

Variable		Estimated Equation	r^2	F
FSMIAS	=	$0.71\ DZNANP - 1.40\ DPINNOP + 1.29\ DEXPTNAR + 0.05\ DMSFAR + 0.36$ (10.75) (-2.98) (11.36) (3.63) (1.69)	0.9602	66.33
FSMDA	=	$6.57\ GINP + 1.50\ PINP + 1.32\ GCNP - 0.11$ (3.53) (3.03) (7.03) (-0.33)	0.9949	774.92
FSMPI	=	$0.94\ GINP + 0.73\ PINP - 0.11\ ZNANP + 1.39\ GCNP - 0.13$ (4.67) (2.33) (-13.26) (13.09) (0.99)	0.9906	271.93
FSMIDA	=	$0.76\ DGENANP + 0.98\ DPCNP + 1.60\ PINP + 0.18$ (7.99) (4.36) (0.78)	0.8873	34.13
FSMIPI	=	$-0.03\ DMSFAP + 0.05\ GORFSPL + 0.04$ (2.15) (4.89) (0.02)	0.7103	15.92
EXCESS	=	$10.30\ MBP + 1.27\ BAP - 5.74\ NOXNP + 11.55$ (3.39) (2.97) (-3.09) (1.64)	0.9207	46.44
EXCESSC	=	$0.04\ M1 + 0.05\ NOXNP + 0.00$ (8.53) (3.86) (0.00)	0.9896	666.20
ADNP	=	$6.82\ ZNANPL + 27.97\ M1PL - 12.58$ (-8.73) (11.53) (3.44)	0.9450	111.59
DANP	=	$0.82\ GENANP + 1.50\ PENANP - 1.43$ (6.92) (7.74) (-1.92)	0.9956	1470.47
MBP	=	$0.24\ GENANP + 0.37\ DENANP - 1.22$ (3.53) (3.01) (-2.82)	0.9801	319.94

where *GYNOXR* is the growth of real non-oil income; *GM1L* is the lagged growth of the money supply, and *FAXL* is the inflation rate lagged one year minus the inflation rate lagged two years.

The basic monetarist contention is: (1) that the causal relation runs from money to prices and output; (2) any persistent increase in money relative to output is a sufficient condition for inflation; (3) the magnitude and length of inflation is dependent on the magnitude and persistence of monetary growth; (4) the occurrence of inflation is independent of the level of employment in the economy, and (5) it is the increasing growth rate of money which yields inflationary pressures.

The major assumptions of the monetarist model are valid for developing economies such as Saudi Arabia in the sense that the structural conditions, institutions and usual governmental actions *vis a vis* the economy are not in any way incompatible with the model. For example, in such economies expansionary monetary policies are often pursued in order to utilize idle resources often resulting in monetization of the rural economy.

The monetary explanation appears to perform very poorly over this period. By itself the rate of growth of money (*RM1*) only explained 47.30 percent of the observed rate of inflation. Also when combined with other variables, *RM1* often has a negative sign. In fact better results were obtained by simply regressing the rate of world inflation on domestic inflation. By itself world inflation accounts for about 75 percent of the fluctuations in domestic inflation. Lagged world inflation, however, does not significantly contribute to the regression equation when introduced with current world inflation. This variable (*GWPL*) does, however, become significant when regressed with the growth of money.

Of the other variables examined in this context, expected inflation (defined here as the difference between last year's inflation and the rate of inflation in the prior year) was highly significant and positive when regressed on current period inflation. This indicates that the cost of holding money is an important element influencing behavior in Saudi Arabia.

The inadequacy of the monetarist model in explaining the rate of inflation in Saudi Arabia raises the question as to whether or not the money supply is an exogenous variable in the kingdom. If the money supply increases in response to other forces such as industrialization, some inflation will be an inevitable result of the structural factors underlying changes.

Conclusions

Standard analysis of the balance of payments in OPEC countries is usually based on real variables (oil sales and prices on the one hand, import demands on the other) and focuses on the current account in the balance of payments. The approach developed here considers those factors which affect monetary equilibrium — income prices, interest rates, and domestic assets — and does not focus exclusively on any one component in the balance of payments account.

The desirability of considering more than just the current account arises from the increasing importance of the capital account activities of the country. Because of the international investment activity of the Saudi Arabian government, the country's balance of payments accounts may no longer be analyzed in terms of current account balances alone. The broader view of our approach offers a framework for analyzing the balance on the entire account, an approach which focuses on long run changes, and a model which appears to be consistent with recent events affecting the country.

Finally, the lack of a significant relationship between the growth of money and inflation raises some questions as to Saudi policy concern over the control of domestic liquidity. Two questions arise: (1) can the authorities control the money supply, and (2) should they pursue tight monetary control at the risk of slowing down growth?

INFLAZIONE E SVILUPPO BASATO SUL PETROLIO: FALLIMENTO DEL MODELLO MONETARISTA NELL'ARABIA SAUDITA

La natura del processo inflazionistico nell'Arabia Saudita deve essere identificata e quantificata prima di poter prendere intelligenti decisioni fondamentali di lungo periodo come il tasso di produzione petrolifera, il livello della spesa interna governativa e il valore del cambio riyal/dollaro. Allo scopo di identificare il tipo e le origini dell'inflazione che si è verificata nel regno soprattutto dopo il 1972 l'articolo si pone tre questioni fondamentali: 1) in che misura l'inflazione recente è stata importata anziché generata all'interno; 2) quale ruolo esattamente hanno avuto le spese governative nel creare e sostenere le pressioni inflazionistiche, e 3) se il meccanismo monetario esistente nel paese sia stato fondamentalmente diverso da quello esistente nella maggior parte di altri paesi in via di sviluppo e, in caso positivo, in che modo e con quali implicazioni per la politica di stabilizzazione.

Per analizzare le origini della pressione inflazionistica, sono stati esaminati statisticamente parecchi modelli. Questi includono un modello monetarista fondamentale, un modello keynesiano e diverse versioni eclettiche. I risultati per il periodo 1960-1980 indicano che la spiegazione monetaria dell'inflazione appare adeguarsi molto poco al paese. Il tasso di crescita della moneta spiega soltanto il 47,30% del tasso d'inflazione osservato. In effetti risultati migliori sono stati ottenuti con una regressione semplice fra il tasso dell'inflazione mondiale e quello dell'inflazione nazionale. Considerata da sola l'inflazione mondiale spiega circa il 75% delle fluttuazioni dell'inflazione interna. Per quanto riguarda le altre variabili esaminate in questo articolo, l'inflazione prevista (definita come la differenza fra l'inflazione dell'ultimo anno e il tasso d'inflazione dell'anno precedente) è altamente significativa e positiva quando regressa sull'inflazione del periodo corrente. Questo risultato indica che il costo di detenere moneta è un elemento importante che influenza il comportamento dell'Arabia Saudita.

L'inadeguatezza del modello monetarista nella spiegazione del tasso d'inflazione in Arabia Saudita pone il problema se l'offerta di moneta del paese sia una variabile esogena o no. Se l'offerta di moneta aumenta in risposta ad altre forze come l'industrializzazione, un poco di inflazione sarà un risultato inevitabile dei fattori strutturali che determinano i cambiamenti.